

SSGIC

General Meeting

October 3, 2002

Sequoia National Forest Headquarters – Porterville, CA

SSGIC Meeting Participants, 10/03/2002

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Overview

The Southern Sierra Geographic Information Cooperative (SSGIC) is an interagency cooperative with five primary stakeholder agencies, Bakersfield BLM, CDF-Tulare unit, Kern Co. Fire Dept., Sequoia National Forest, and Sequoia & Kings Canyon National Parks. The project's primary goal is to develop a landscape scale framework for interagency fire management planning. With data development and preliminary analysis essentially complete, focus has shifted to integrating analysis results into a process to collaboratively identify high priority fuels treatment areas and distributing information via the Website located at <http://ssgic.cr.usgs.gov>. The three-year Joint Fire Sciences Program (JFSP) grant supporting the SSGIC ends December 2002. A December 11, 2002 meeting is scheduled to discuss the future of the SSGIC. **Bold** text indicates an action item.

SSGIC Program Update

Pat Lineback presented an update on the status of the SSGIC program. The program has been supported by a three-year JFSP grant that will end in December 2002. The culmination of the project will be a one half-day workshop presented at the Association of Fire Ecologists (AFE) conference December 2-5, 2002 in San Diego. The next several months will focus on completing the deliverables identified in the grant. The program can continue on a limited basis for several more years since the Program Manager position is funded for an additional two years. Whether and how the program will continue needs to be discussed. A meeting scheduled for December 11, 2002 will present managers and prospective partners with an overview of the program and open discussion on the needs of the region and how they might be met. **Pat Lineback will identify the scope of the meeting and coordinate feedback from each agency as to who should be attending from their agency.**

Data Development

Previous meetings have recognized the need for improved data for vegetation, fuels, and canopy cover. The need was also identified to develop the three optional spatial datasets describing forest canopy characteristics necessary for FLAMMAP to effectively model crown fires. These are tree height, height to crown, and canopy bulk density. The following individuals made major contributions to updating and developing these datasets: Karen Folger, Heidi Hosler, Pat Lineback, Diane Travis, and Anne Birkholz. These datasets are available for download via the Website. Improvements made include:

- Vegetation – Incorporates new vegetation data for the BLM Case Mountain area and improves handling of cross-boundary technical issues.
- Fuels – Incorporates updated fuels data from the Sequoia National Forest and CDF.
- Canopy Cover – Corrected errors in the application of crosswalk tables.
- Tree Height – Source data integrated into this dataset include:
 - ✓ Sequoia and Kings Canyon National Park - existing spatial tree height data.
 - ✓ National Forests – A crosswalk table based on Forest Inventory and Analysis (FIA) data linked to forest CalVeg strata.
 - ✓ BIA and BLM Case Mtn. – A crosswalk table based on extrapolation of forest FIA data, GAP density codes, agency vegetation assignments, and subject matter specialist input.
 - ✓ Other areas - A crosswalk table based on extrapolation of forest FIA data and GAP WHR vegetation codes and density.
- Crown Base Height – Source data integrated into this dataset include:
 - ✓ Sequoia and Kings Canyon National Park - existing spatial height to understory data.
 - ✓ National Forests – A crosswalk table based on Forest Inventory and Analysis (FIA) data linked to forest CalVeg strata.

- ✓ BIA and Case Mtn. BLM – A crosswalk table based on extrapolation of forest FIA data, GAP density codes, agency vegetation assignments, and subject matter specialist input.
- ✓ Other areas - A crosswalk table based on extrapolation of forest FIA data and GAP WHR vegetation codes and density.
- Crown Bulk Density (CBD) – A crosswalk table predicting CBD from density codes was developed. This was based on Bernie Bahro's (USFS, R5) research that supports predicting CBD from stand density independent of vegetation type or size class.

Analysis Updates

Figure 1 displays the analysis flowchart adopted by SSGIC. All preliminary assessments of Risk, Hazard, Value (Ecological and Social/Economic), and Susceptibility are completed. Anne Birkholz presented a review of each analysis.

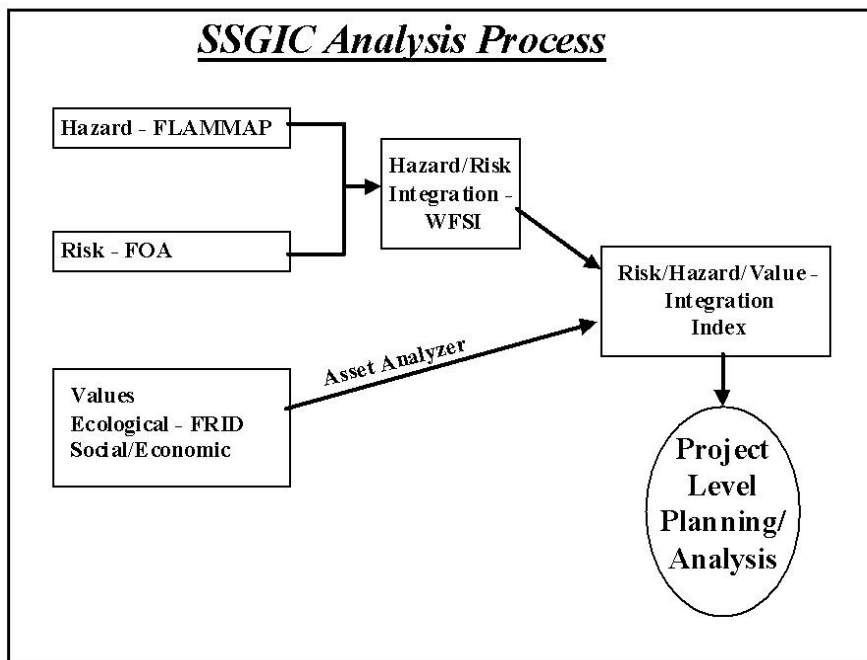


Figure 1

Hazard (FLAMMAP)

The FLAMMAP model predicts the hazard potential for fire behavior across the landscape. It utilizes the same algorithms as the Farsite and Behave models. Based on the initial FLAMMAP runs of April 2002, the decision was made to rerun FLAMMAP incorporating spatial data for tree height, crown base height, and crown bulk density. FLAMMAP generated Rate of Spread (ROS), Flame Length, and Crown Fire Activity incorporating these themes were completed for each of the four weather categories. The updated fuels and canopy cover data were used in these analyses.

Risk (Fire Occurrence Areas (FOA))

This analysis represents the potential risk of a fire ignition occurring and was derived from historic ignition data. No updates have been made to this analysis since the April 17, 2002 meeting.

Hazard/Risk Integration (Wildland Fire Susceptibility Index (WFSI))

WFSI inputs include spatial and non-spatial data. The SSGIC analysis area was stratified by FOA category and ignitions predicted based on the historical ignition data in each strata. Using Fire Family Plus, daily weather data was assigned to weather percentile categories based on Spread Component (SC). Each ignition was linked to the weather on that day and assigned a SC and weather percentile category. A Final Fire Size (FFS) was calculated for each grid cell in the analysis area from FLAMMAP generated Rate of Spread (ROS) based on SSGIC developed regression equations. Next, the likelihood of an ignition and the FFS were multiplied to calculate a WFSI for each cell and each weather percentile category. Finally, values were summed across the weather categories for the final WFSI. The WFSI is not an absolute value, but rather an ordinated index of susceptibility.

The development of the regression equations to predict a FFS from ROS were an important part of the WFSI process. A meeting of fire managers, fuels specialists, and contractor Don Carlton was held in April to develop these equations. Data from NFMAS Suppression Table 1 of the IIAA module for contained fires was used for low ROS values. At higher ROS's, fire progression maps from actual escaped fires were used. The data supported the development of three regression equations as follows:

High Elevation – over 7,500 foot elevation

Grass/Shrub – fuel models 1, 2, 3, 4, 5, 6, 15, and 28 below 7,500 foot elevation

Mixed Conifer – fuel models 8, 9, 10, 11, 12, 13, 14, and 18 below 7,500 foot elevation

A maximum FFS was identified for each equation to prevent prediction of unrealistically large FFS's at high ROS's. These were 34,000 acres for Grass/Shrub, 7,500 acres for Mixed Conifer, and 3,500 acres for High Elevation.

One issue noted was that a large acreage of the SSGIC is in the 0 FOA category with a 0 probability of ignition. In reality, the probability is very low, but not 0. Since the probability of ignition is multiplied by the Final Fire Size, WFSI values of 0 are calculated in erroneously. Meeting notes from April 7, 2002 detailing the process are available on the Website.

Values – Ecological (Fire Return Interval Departure (FRID))

This analysis was based on research identifying historic fire regimes and provides an index to rank areas based on their deviation from historical fire regimes. It is a measure of the ecological benefits of fire. An updated FRID analysis was run that incorporated several improvements. The updated vegetation dataset was used as well as the 2001 Fire History data provided by CDF (the previous FRID was based on the 2000 Fire History). Additionally, because of the significant impact of the McNalley fire (144,000 acres) on the Sequoia National Forest in 2002, it was added to the fire history data.

Source spatial data for the FRID included vegetation classification and historic fire perimeters. Non-spatial data includes Fire Return Intervals (FRI) that represent the historical (preEuropean) burn intervals. FRI values were originally assigned to Sequoia and Kings Canyon National Park vegetation codes, but have not been developed for other vegetation classification systems. Consequently, vegetation codes outside the park were cross-walked to Wildlife Habitat Relationship (WHR) vegetation codes and FRI values assigned to these codes. In the FRID model, the assigned FRI is compared to the length of time since the last recorded fire. The number of intervals “missed” is calculated as the departure from FRI.

Values – Social/Economic (Asset Analyzer)

Social and economic values are dynamic and evaluated utilizing the Asset Analyzer decision making tool developed by the SSGIC. The section below discusses both the application and datasets for use with it.

Asset Analyzer Application and Data Review

The Asset Analyzer was originally developed by the California Department of Forestry and Fire Protection (CDF) to apply a weighted sum to selected datasets to identify areas of high value. It was manually run and the resolution was insufficient for project level analysis. The SSGIC has enhanced the original CDF model and developed the ArcView Spatial Analyst extension as a decision making tool. It incorporates a “user friendly” interface and the resolution is limited only by the source datasets. The user begins by selecting the source datasets to be included in the analysis. Weights are then applied to each datasets defining its percent contribution to the final output. The user can define the project area in any of several ways and determine the resolution of the final output. Once the analysis is run to calculate the weighted sum (Fig 2), the normalized output can be categorized into classes for display (Fig 3).

All spatial datasets used as source data need to be formatted specifically for use in the Asset Analyzer. They must be in grid format and, to be equally represented in the analysis, normalized between 0 and 100. As an example, for datasets such as Sequoia Groves, the value of a grove is 100 while areas outside groves receive no value. For other datasets, such as the value of range forage, the entire scale from 0 to 100 is utilized. Datasets categorized as high, medium, or low, such as crown fire activity, are represented as 100, 68, and 33 respectively. Table 1 in Appendix A lists the datasets developed by the SSGIC for use with the Asset Analyzer to evaluate Social/Economic values. Table 2 in Appendix A lists analysis outputs normalized for Asset Analyzer use as a decision-making tool. Scenario outputs are dependent on both the selection of source datasets, as well as the weights assigned to each source. The Asset Analyzer outputs themselves are grids normalized over the 0 – 100 range of values.

Version 1 of the Asset Analyzer was demonstrated; however, a contract is currently being negotiated to develop Version 2. Some of the limitations of Version 1 and enhancements that will be implemented in Version 2 were identified. The Asset Analyzer has application both in its original context of identifying areas of high values at risk should a fire occur, as well as in the broader context of a decision-making tool. It is being used by SSGIC in both contexts.

Each agency was encouraged to develop their own datasets of locally important values. Larry Vredenburgh and Tony Sarzotti presented five themes developed by the Bureau of Land Management (Table 3 in Appendix A).

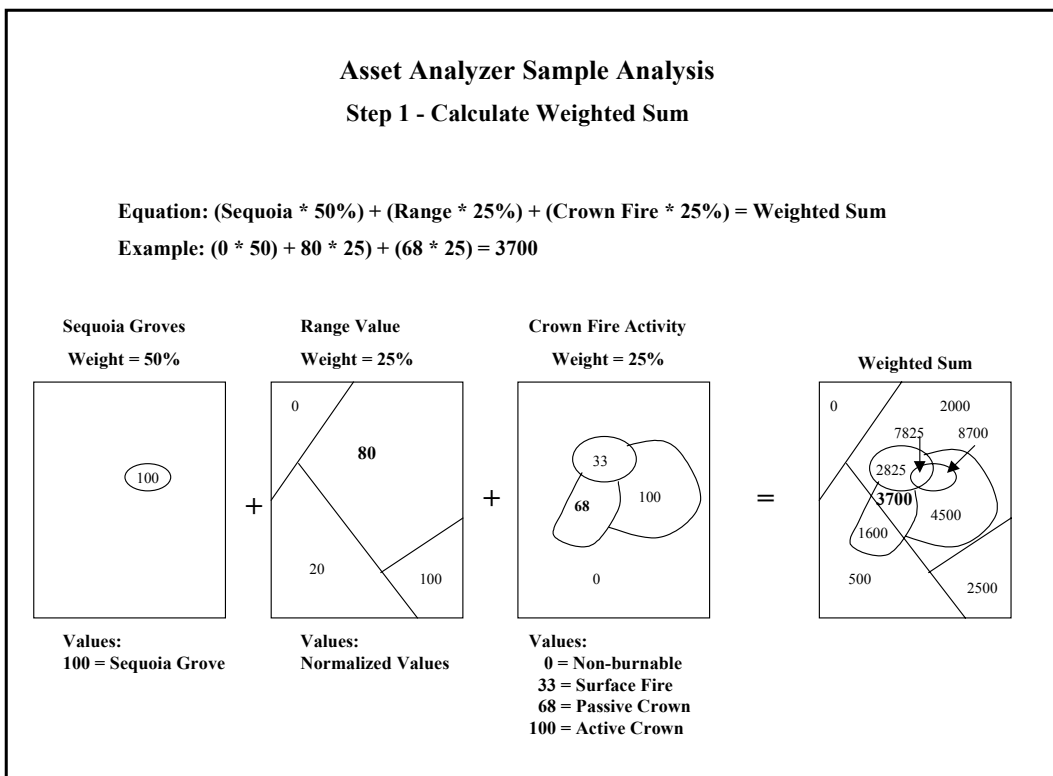


Figure 1

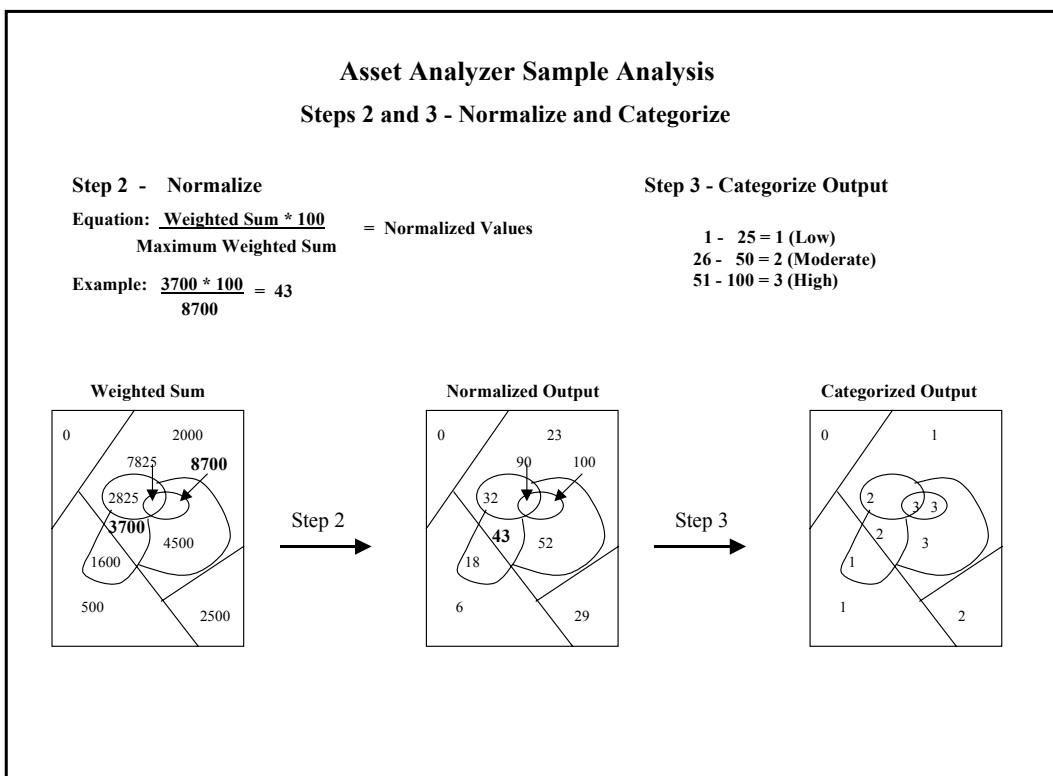


Figure 2

Interagency Analysis Integration Meeting

The final step in the SSGIC analysis flow chart is the integration of Hazard, Risk, and Value into a final product that will be used for project level planning and analysis. On October 2, 2002 fire managers and fuels specialists met to begin developing the process to collaboratively identify high priority fuels treatment areas across the Southern Sierra Nevada. Brent Skaggs presented a summary of this meeting. Prototype scenarios were interactively developed, entered into the Asset Analyzer, and analyzed. These served to get a “feel” for how the Asset Analyzer worked, its sensitivity, resolution of the outputs, etc. Conclusions reached included that too many source datasets resulted in “watered down” outputs and that the WFSI masked the individual FOA and FLAMMAP contributions. The decision was made to focus on the stated SSGIC goal to benefit fire management operations by:

- Reducing fuel loadings
- Increasing firefighter safety
- Decreasing resistance to control

A two-phase process was defined. The initial phase will focus on seven source datasets selected by this group and evaluated at the landscape level using low resolution analysis (500 meter grid cell size). These outputs will be used to select smaller focus areas based on identified “hot spots” and opportunities for cooperative planning; ie., near jurisdictional boundaries. A second phase will evaluate the focus areas to collaboratively identify priority fuels treatment projects with a focus on interagency benefits. This will be carried out at high resolution (30 meter grid cell size) for project level planning.

Table 1 contains the seven selected datasets for phase one with 10 weighting scenarios developed. The selected datasets include:

- FOA – Eight categories based on 20 years of historical ignition data. Units of the original data are ignitions per 1000 acres per year. Category 8 (normalized to 100) represents more than 2 ignitions per 1000 acres per year.
- FRID – Five categories defined by the number of Fire Return Intervals (FRI) missed follow:
 - 0 = non-burnable,
 - 25 = no return intervals missed
 - 50 = 1-2 intervals missed
 - 75 = 2-5 intervals missed
 - 100 = 5-16 intervals missed
- FRID Confidence – The level of confidence in the FRI is highly dependent on the vegetation type. For example, sufficient data has been collected in the Ponderosa pine type to feel confident in the FRI values. However, very little data is available on FRI’s for grasslands or desert types. Consequently, the value placed on the FRID in an analysis may be dependent on the level of confidence in the data. Categories are:
 - 0 = non-burnable
 - 25 = estimate
 - 50 = very poor

75 = poor
100 = good

- Threatened Wildland Urban Interface (WUI) – This dataset was provided by CDF. It contains one and one half mile buffers around the federally identified WUI's (housing densities greater than one house per 40 acres in wildland fuel types). Assigned values of 33 (low), 68 (moderate), or 100 (high) are based on a combination of hazard rank and fire probability.
- Firefighter Safety – This theme was developed implementing the Sequoia and Kings Canyon National Parks model for firefighter safety. Five datasets contributed to the model and a weighted sum was calculated and values of low (33), moderate (68) or high (100) assigned. Input datasets and weights were:

Source dataset	High	Moderate	Low
Fuels	9	6	1
Slope	9	5	1
Aspect	5	3	1
Elevation	3	2	1
Road accessibility	7	4	1

- Flame Length/Extreme Weather – This dataset was generated by FLAMMAP and predicts flame length. The classifications were derived from the Hauling Fire Characteristics Chart descriptions of initial attack strategies. They are:
0 = non-burnable
25 = 0-4 feet - direct attack with hand crews
50 = 4-8 feet - direct attack with equipment such as engines and retardant
75 = 8-11 feet – indirect attack of fire required
100 = 11+ feet – indirect attack unlikely to be successful

The extreme weather category (98-100 weather percentile) was selected to focus on the most severe behavior.

- Crown Fire Activity/Extreme Weather – This dataset was also generated by FLAMMAP and predicts crown fire behavior. A value of 33 represents predicted surface fires, a value of 68 predicts passive crown fires, and a value of 100 represents active crown fires. Again, the extreme weather category was selected to focus on the most severe behavior.

Scenario Number	1	2	3	4	5	6	7	8	9	10
Dataset	Assigned Weights									
FOA	14	17	17	20	0	0	0	0	0	0
FRID	14	17	17	20	25	20	12	25	52	12
FRID Confidence	14	13	0	0	0	0	0	25	0	0
Threatened WUI's	14	17	17	20	25	20	52	25	12	12
Firefighter Safety	14	0	17	0	0	20	12	0	12	52
Flame Length – Extreme Weather	14	17	17	20	25	20	12	25	12	12
Crown Fire Activity–Ext. Weather	15	18	17	20	25	20	12	0	12	12

Each agency will evaluate the results and come to the next meeting, scheduled for October 30, 2002, prepared to discuss these results and proceed with the second phase of the analysis. Details of the meeting can be found in the summary of the October. 2, 2002 meeting.

Web Site Update

Pat Lineback demonstrated the significant progress made by the SSGIC Website (<http://ssgic.cr.usgs.gov>). A standard ArcIMS template has been developed for use by all stakeholder agencies that will simplify the process of developing map services and insure a consistent look and feel. Many more datasets and analysis products are available for download. A map interface to download quad data via “point and click” on a map is now available. All analysis products are implemented as map services for online viewing. Documents describing the file structure and file naming conventions implemented on the Web site are also available. SSGIC is currently evaluating options for developing an advanced security plan for the web server.

Discussion of Framework for Inventory and Monitoring

MaryBeth Keifer led a discussion on the potential to develop a collaborative framework for fire and fuels related inventory and monitoring for the Southern Sierra Nevada. The SSGIC has some funds that could be used to develop a process. Points discussed included what data may already be available by each agency, the need to avoid a “stovepipe” approach in favor of developing a business plan, the expense and agency commitment needed for implementation, and the potential benefits.

Upcoming Meetings

The following activities are scheduled for the SSGIC in the upcoming months.

- October 30, 2002 – Fire managers and fuels specialists meet to continue the process to identify high priority fuels treatment areas.
- December 2-5, 2002 – 2002 Association of Fire Ecologists Conference in San Diego – SSGIC will be presenting a ½ day workshop.
- December 11, 2002 – Present the SSGIC program to managers and consider its future form

Appendix A – Datasets Developed for Asset Analyzer Use

Table 1 - Base datasets

Theme Name	Categories/Values Assigned	Theme Description or Definition
Hydroelectric power generation	1 - 98	20 miles upstream watershed, megawatt capacity, river run vs. reservoir plant
Range forage	0 - 100	Dollar value of replacement forage normalized
Giant Sequoia Groves	0, 100	Mature Sequoia groves
Soils erosion potential	0 - 89	Slope times K factor normalized
Water storage	0, 100	20 miles upstream watershed from storage reservoirs
Water supply	1-100	One fourth mile buffer around domestic water diversions, number of diversions
Structures	0 - 100	2002 Census housing density as surrogate
Threatened Wildland Urban Interface (WUI)	4 categories	Federally identified WUI cities with hazard potential buffers; 0 = None 33 = Low 68 = Moderate 100 = High
Fire Frequency	0, 10, 20,30, current max = 80	Number of historically recorded fires times 10, current maximum of 80 (8 fires)

Table 2 - Analysis outputs

Theme Name	Categories/Values Assigned	Theme Description or Definition
FOA	9 categories	Density of ignitions derived from 20 years ignition data
FRID	5 categories	0 = non-burnable, 25 = no return intervals missed 50 = 1-2 intervals missed 75 = 2-5 intervals missed 100 = 5-16 intervals missed
FRID confidence level	5 categories	0 = non-burnable 25 = estimate 50 = very poor 75 = poor 100 = good
FLAMMAP Flame Length Low weather category	5 categories	0 = non-burnable 25 = 0-4 feet 50 = 4-8 feet 75 = 8-11 feet 100 = 11+ feet
FLAMMAP Flame Length Extreme weather category	5 categories	
FLAMMAP Crown Fire Activity Low weather category	4 categories	0 = non-burnable 33 = surface fire 68 = passive crown fire 100 = active crown fire
FLAMMAP Crown Fire Activity Extreme weather category	4 categories	
FLAMMAP Rate of Spread Low weather category	10 categories	Normalized outputs
FLAMMAP Rate of Spread Extreme weather category	10 categories	Normalized outputs
Final Fire Size from WFSI Low weather category	9 categories	Normalized outputs
Final Fire Size from WFSI Moderate weather category	9 categories	Normalized outputs
Final Fire Size from WFSI High weather category	9 categories	Normalized outputs
Final Fire Size from WFSI Extreme weather category	9 categories	Normalized outputs
WFSI	10 categories	Normalized outputs

Table 3 - BLM Datasets

Theme Name	Categories/Values Assigned	Theme Description or Definition
Pacific Crest Trail	0, 100	One mile buffer around trail
BLM campgrounds	0, 100	One mile buffer around campgrounds
BLM wilderness	25, 50, 75, 100	Designated wilderness with values from fire response zones
BLM special areas	25, 50, 75, 100	Special interest areas with values from fire response zones
BLM fire stations and communication towers	50, 100	One mile buffers; fire stations = 100 communication towers = 50